Getting Started with TRENDABLE

Welcome to TRENDABLE, the only quality control reporting solution for small manufacturers. This tutorial will acquaint you with the key features in TRENDABLE and how to use them.

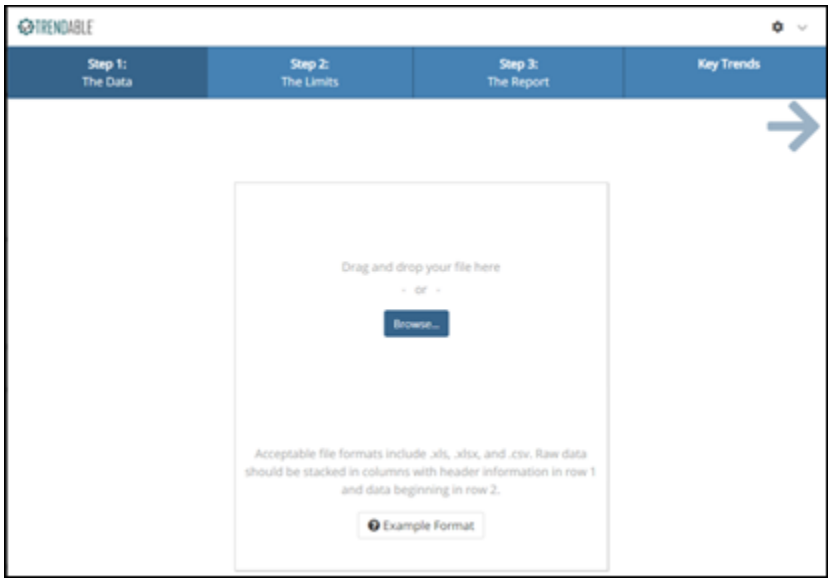
For this tutorial, you are a Quality Engineer for HeartsRUs, a premiere supplier of angioplasty products. You are charged with evaluating the quality of heart stents and the capability of the stent making process.

The stents are intended to be 16.8 millimeters long, with a tolerance of ±1 millimeter. Your team measures 10 stents each day for 5 days and records the data in a text file called, *Stent Length-Week 1.csv*. We'll analyze these data in three easy steps:

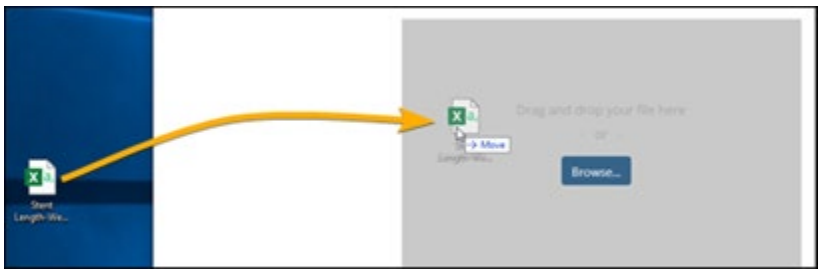
- Step 1: Import the data.
- Step 2: Apply the specification limits (spec limits).
- Step 3: Review the report.

Step 1: Import the Data

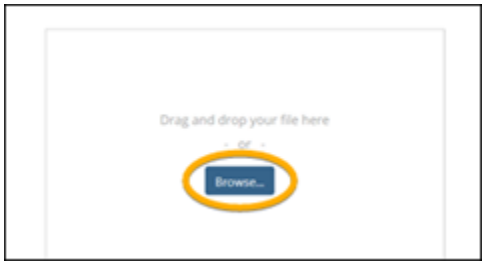
1. Log in to TRENDABLE at https://app.gotrendable.com.
   TRENDABLE opens and you're ready for Step 1, importing the data.



2. To import the data file, *Stent Length-Week 1.csv* into TRENDABLE, do one of the following:
   - Drag and drop the file into the data import box.



   - Or click **Browse** (circled below), then navigate to the file and open it.

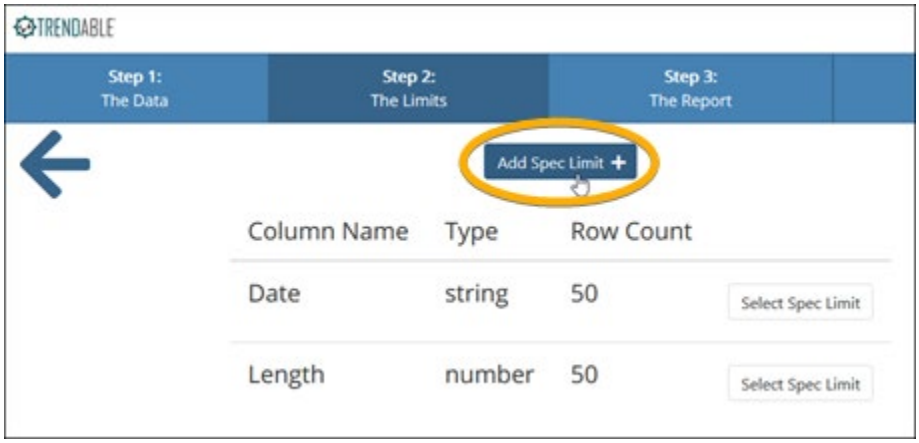


3. Click **Next** to go on to Step 2.

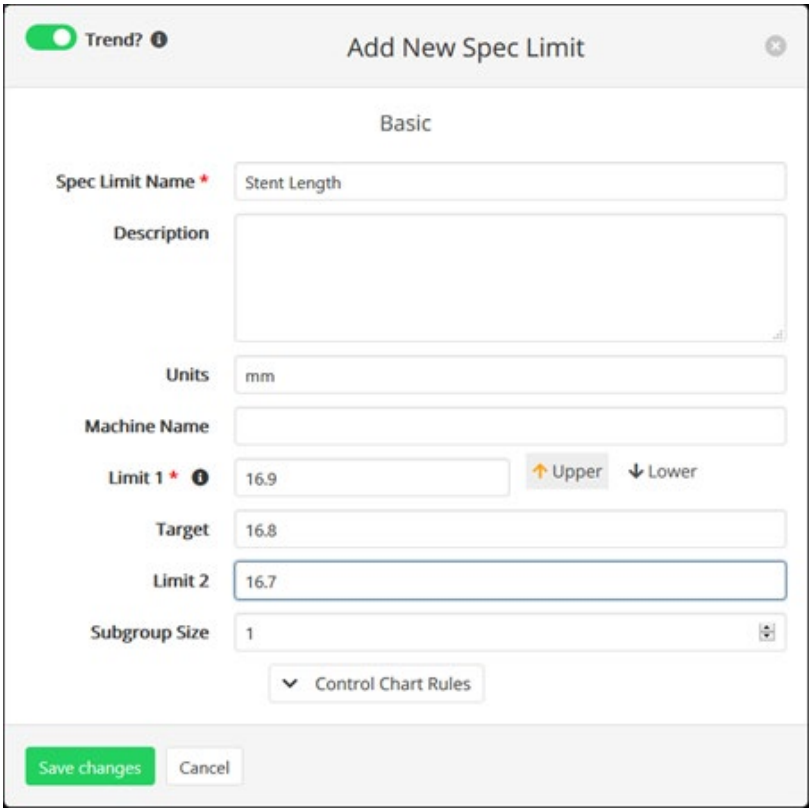
Step 2: Apply the Specification Limits

We'll need to define the spec limits before TRENDABLE can analyze the data.

1. Click **Add Spec Limit**.



2. Enter a name for the spec limit, such as "Stent Length", then enter the units, the target, and the upper and lower limits as shown below.

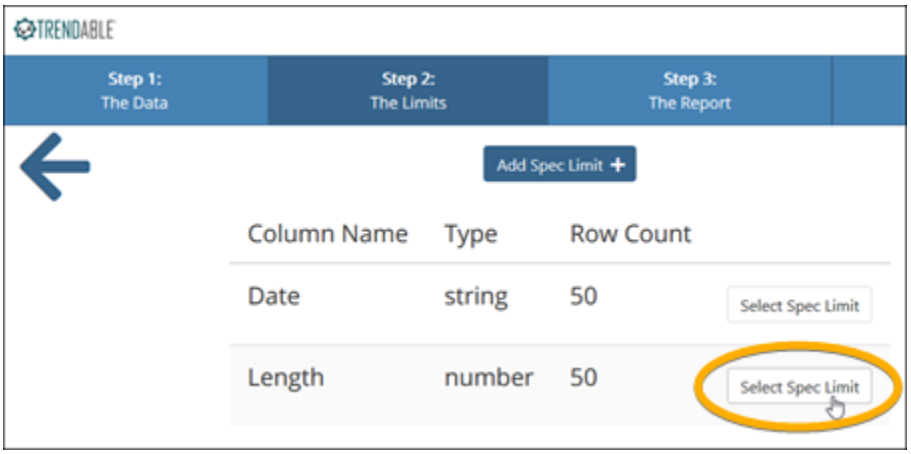


3. When you're done, click **Save changes**.

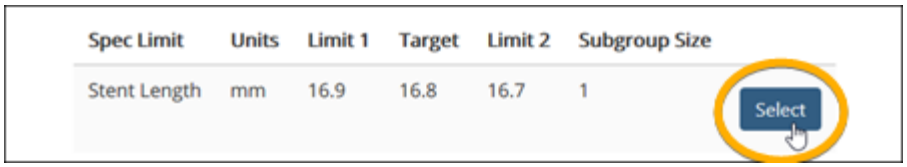
Note: To view and edit spec limits after you create them, click the gear icon ( ) in the upper right and select **Specification Limits**.

Next, we'll apply our new spec limit to the *Length* column in the data set.

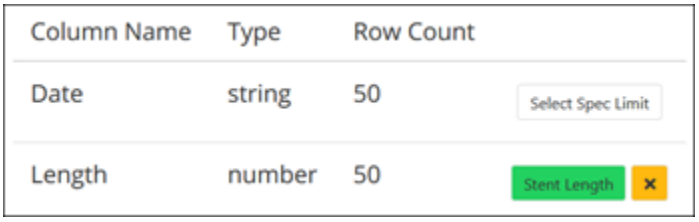
4. Click the **Select Spec Limit** button next to **Length**.



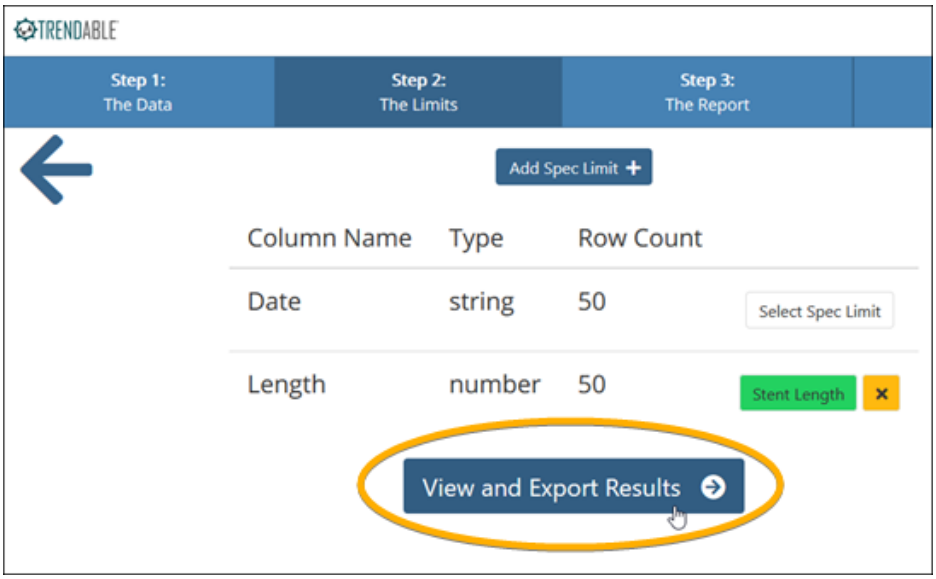
5. Click **Select** button for the Stent Length spec limit that we just created.



TRENDABLE shows that the Stent Length spec limit has been selected for the Length column.



6. Click **View and Export Results** to go on to Step 3.



Step 3: View and Save the Report

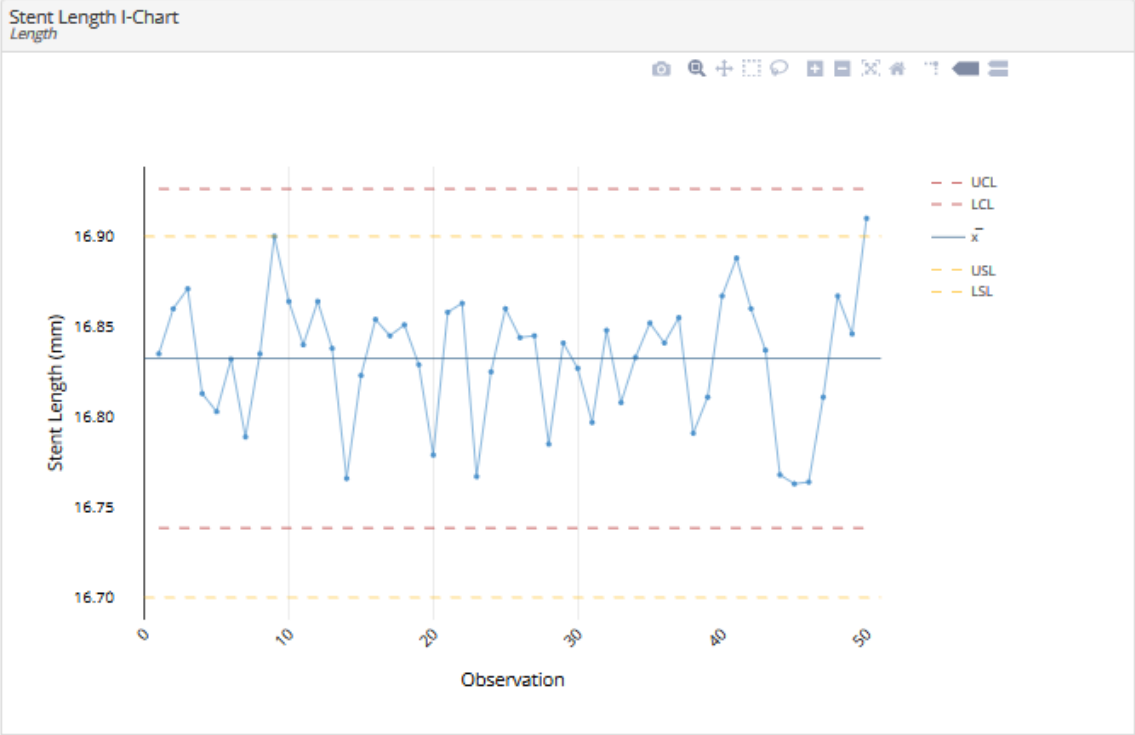
TRENDABLE analyzes each column of data for which you specify a spec limit. By default, the report includes the following:

- A control chart — shows the variability in your sample values over time and detects potential problems.
- A capability graph — shows how the sample measurements compare to the specification limits.
- A table of statistics — shows common summary statistics, such as the mean, and common capability statistics, such as Ppk and Cpk.

Note: To change the default output for future reports, click the gear icon ( ) in the upper right and select **Report Settings**.

I-Chart

Because our data did not include subgroups, TRENDABLE displays an I-Chart of the measurement data.



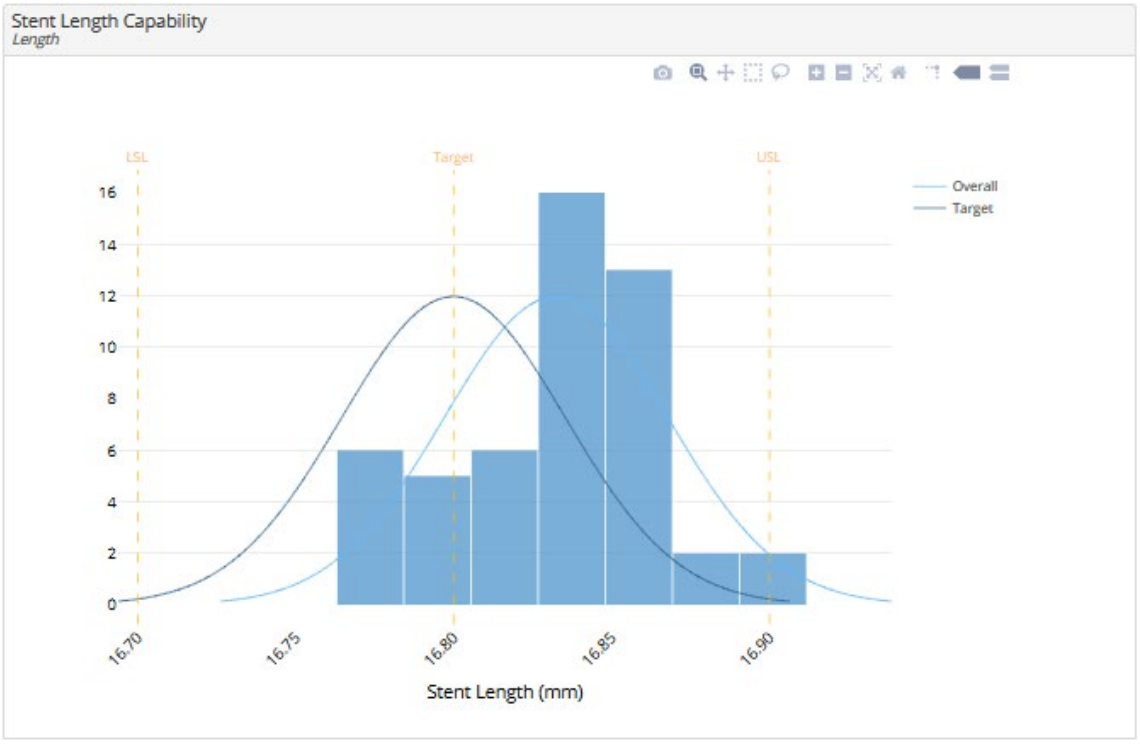
If your process is running smoothly, the points should vary randomly about the center line. All points should be between the upper control limit (UCL) and the lower control limit (LCL). In addition, TRENDABLE performs several tests on your data to help identify potential problems. Points that fail any of these "tests for special causes" are indicated with a red square instead of a blue circle.

The I-chart of the week 1 data does not indicate any problems; the process appears to be in control.

Tip: TRENDABLE graphs are interactive. For example, hover your cursor near a point on the graph for additional details about that point. Take time to explore the many features of TRENDABLE graphs.

Capability Graph

The capability graph compares your sample data to the specification limits.



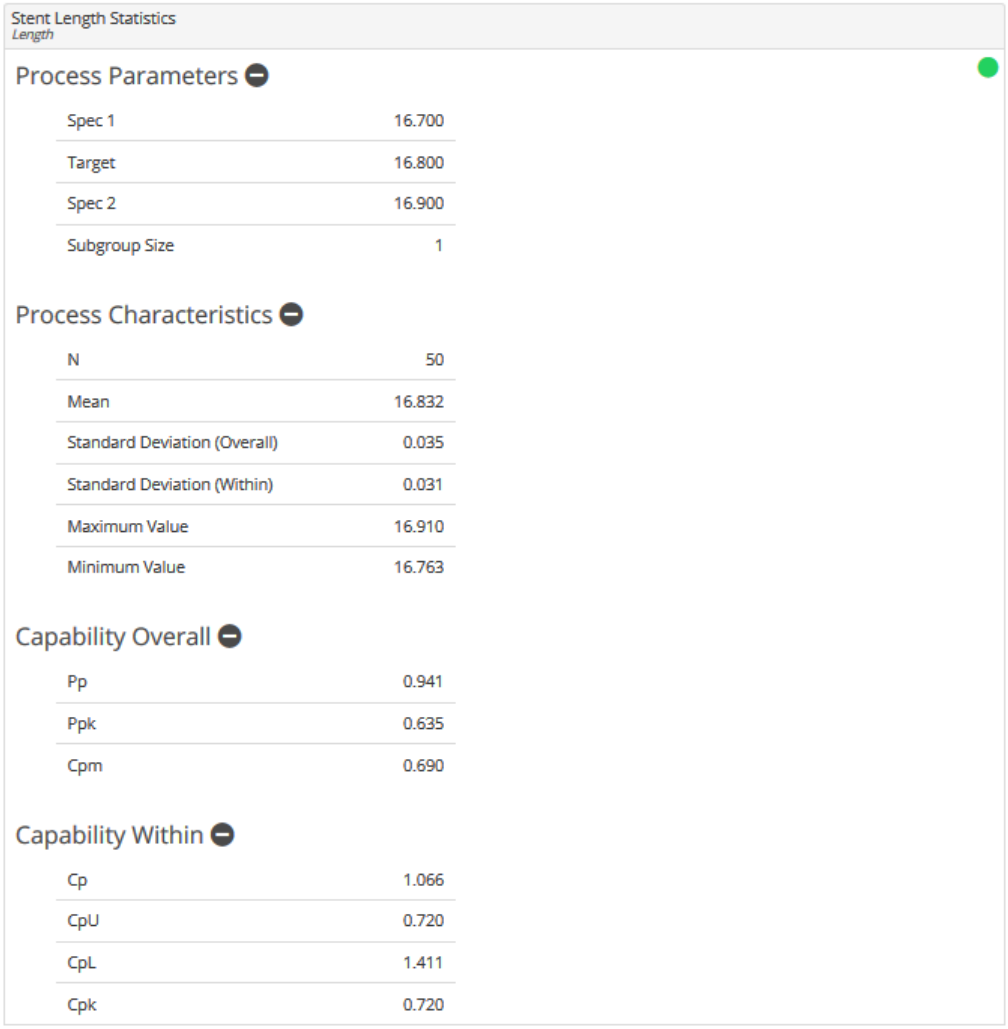
Each bar on the histogram indicates the number of sample values (y-axis) that fall within the indicated range of measurement values (x-axis). For example, the first bar on the left indicates there are 6 measurements in the sample that fall between 16.76 mm and 16.78 mm.

The capability graph indicates that the stents are generally longer than the target of 16.80 mm. The fitted normal curve (labeled “Overall”) extends past the upper spec limit (USL). This suggests that if we measure a lot more parts, we’ll find that a lot of them are longer than 16.90 mm.

Note: The fitted curves and capability statistics assume that process output is distributed normally.

Table of Statistics

The statistics table includes summary statistics and capability statistics for your sample.



Stent Length Statistics
Length

Process Parameters

Spec 1	16.700
Target	16.800
Spec 2	16.900
Subgroup Size	1

Process Characteristics

N	50
Mean	16.832
Standard Deviation (Overall)	0.035
Standard Deviation (Within)	0.031
Maximum Value	16.910
Minimum Value	16.763

Capability Overall

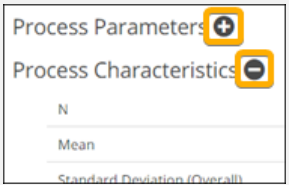
Pp	0.941
Ppk	0.635
Cpm	0.690

Capability Within

Cp	1.066
CpU	0.720
CpL	1.411
Cpk	0.720

The Ppk and Cpk values indicate that the process is not very capable. In other words, based on the mean and variability of our sample, a high number of the parts produced by the process are not within the specification limits.

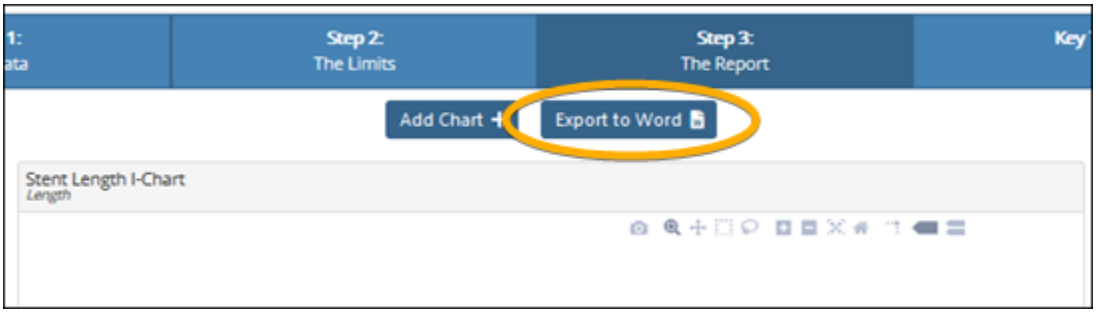
Tip: To collapse or expand a table, click the circle next to the table's heading:



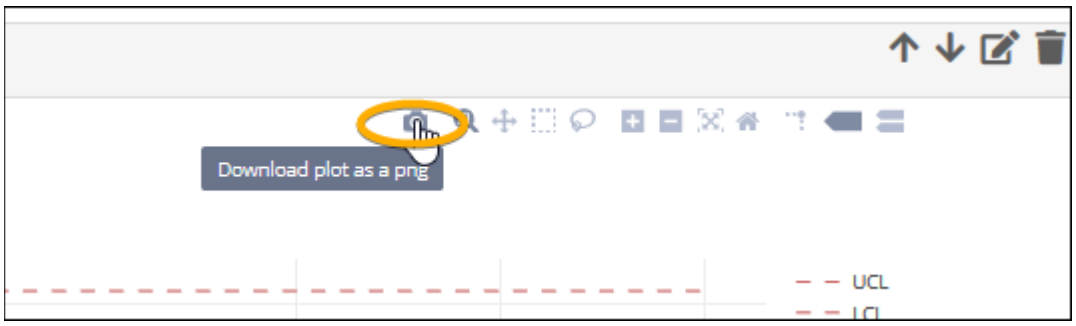
Congratulations! You've successfully run your first analysis in TRENDABLE!

Save the Report to Microsoft Word

To save the full report for future reference, click **Export to Word** at the top of the report screen.



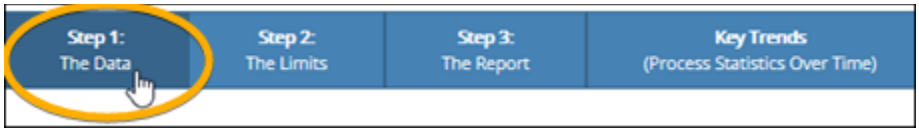
To save an individual graph, click the camera icon (📷) above the graph.



Analyze the Data for Week 2

Based on your analysis of the week 1 data, your team implemented some process improvements that are intended to re-center the process output on the desired target of 16.80 mm. Analyze the data for week 2 to see whether the improvements worked.

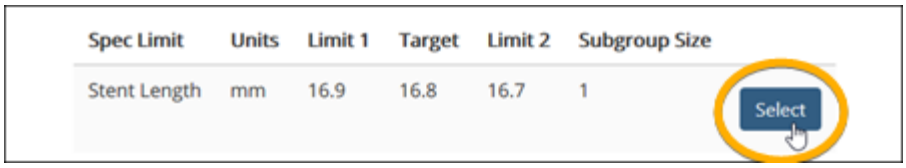
1. Click the **Step 1** tab to go back to the data import screen.



2. Import the data file, *Stent Lengths – Week 2.csv*.
3. Click **Next** to go on to Step 2.

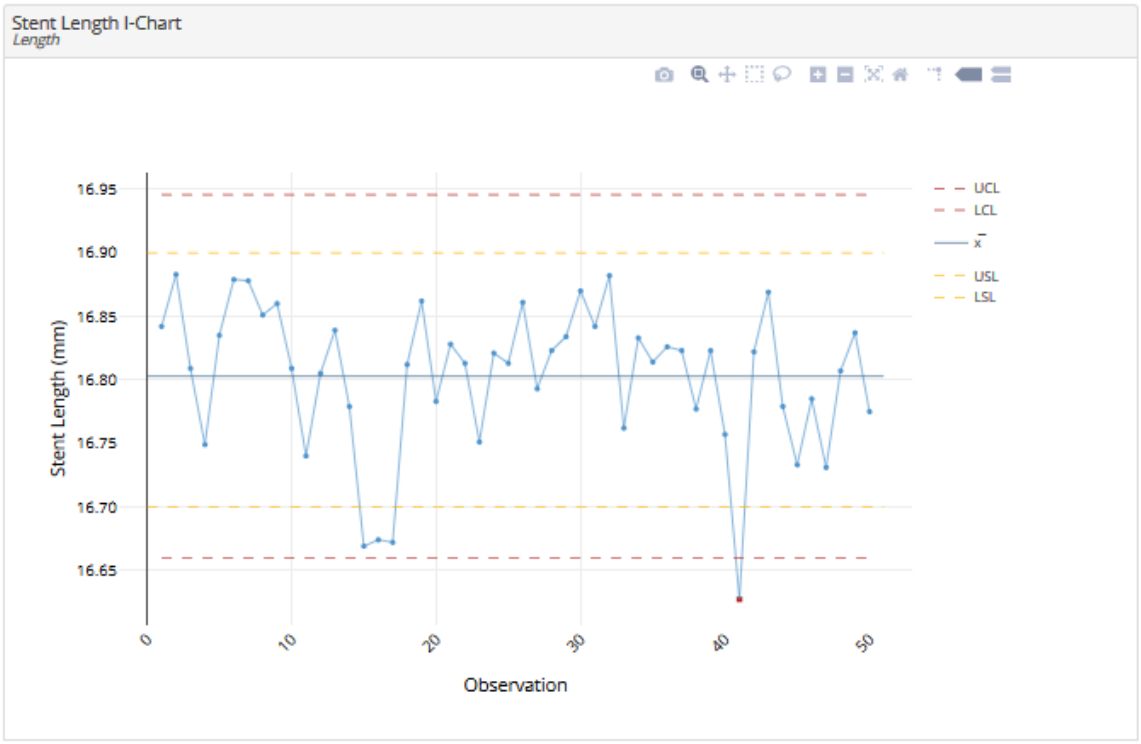
This time, we don't have to define the spec limit because it's already saved and ready to use.

4. Click the **Select Spec Limit** button for the Length column.
5. Click **Select** to apply the Stent Length spec limit.



6. Click **View and Export Results** to view the report.

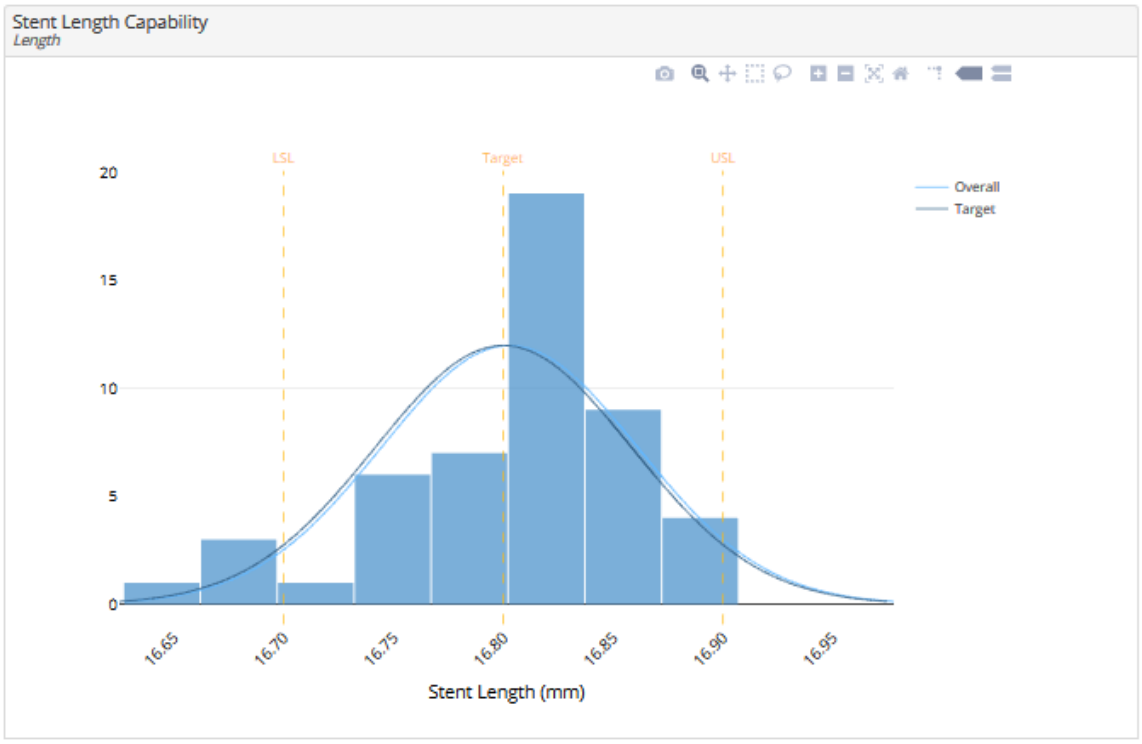
I-Chart



The good news is that the mean of the parts, indicated by the center line, is very close to the desired target of 16.80.

The bad news is that the I-chart indicates a potential problem. Sample 41 is especially small for some reason; it's below the lower control limit. You'll want to see if you can find any reasons for this and correct any problems that may be causing stents to be short.

Capability Graph



The Overall curve shows that the process is centered much better than it was in week 1. However, the distribution seems to be more spread out than it should be. The is especially true on the left side.

Table of Statistics

Process Characteristics

N	50
Mean	16.803
Standard Deviation (Overall)	0.058
Standard Deviation (Within)	0.048
Maximum Value	16.883
Minimum Value	16.627

Capability Overall

Pp	0.571
Ppk	0.555
Cpm	0.571

Capability Within

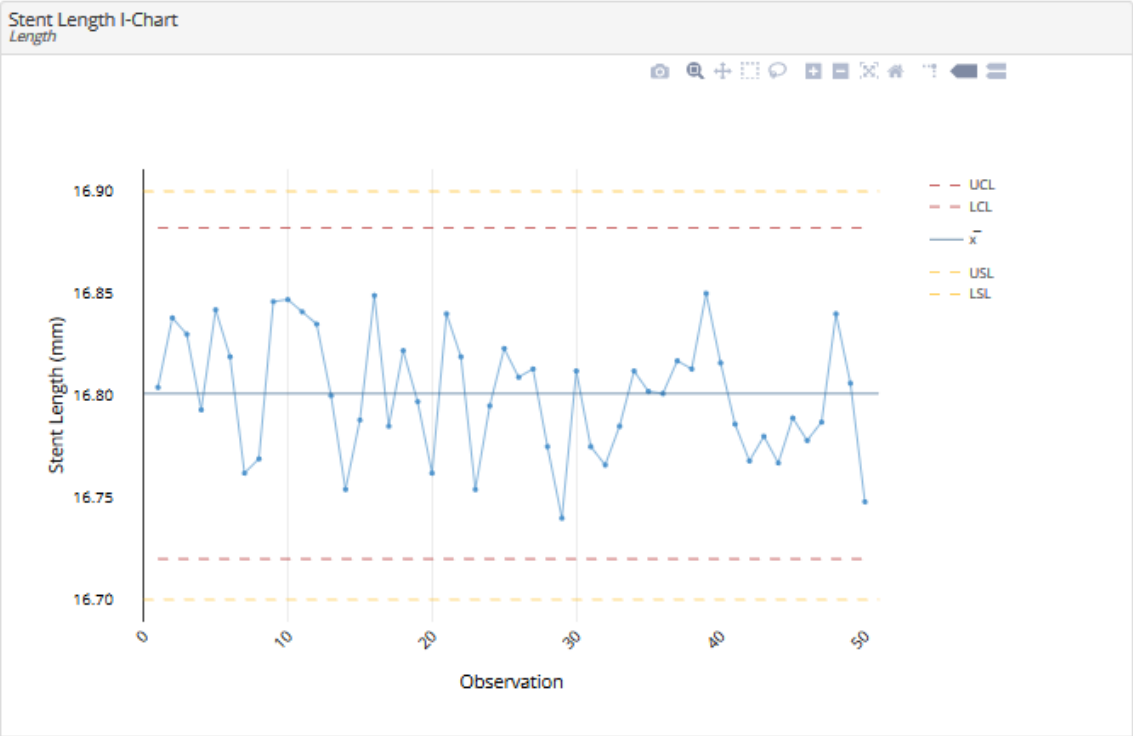
Cp	0.700
CpU	0.680
CpL	0.719
Cpk	0.680

The capability statistics indicate that, even though the mean of the process is a lot closer to the target, the process is slightly *less* capable than it was in week 1. To improve capability, you'll need to decrease the variability in the process while keeping the mean of the parts centered on the target length of 16.80 mm.

Analyze the Data for Week 3

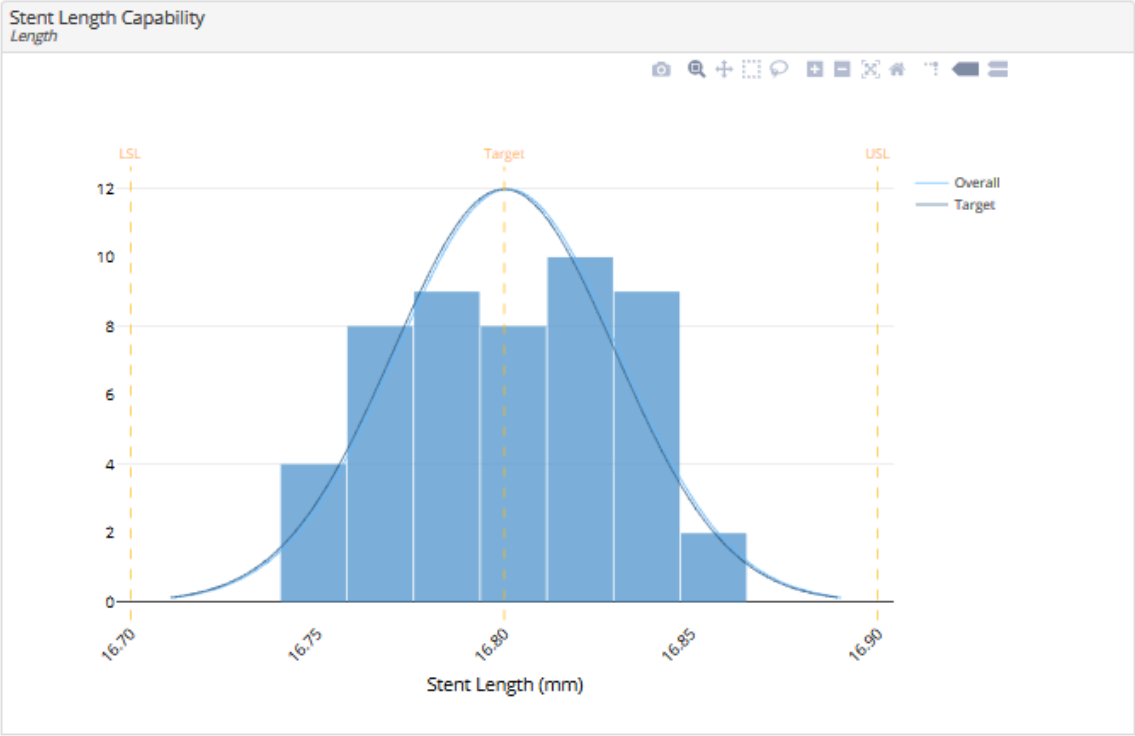
After week 2, your team worked hard to reduce the process variability and reduce the number of unusually small stents. Import and analyze *Stent Lengths – Week 3.csv* to see how they did.

I-Chart



The I-chart looks good. The mean appears to be right on target. All the points are within the control limits and none of them failed any of the tests for special causes.

Capability Graph



The capability graph shows that the data are much more tightly grouped around the mean then they were in week 2. All the bars on the histogram are well within the spec limits.

Table of Statistics

Process Characteristics

N	50
Mean	16.801
Standard Deviation (Overall)	0.030
Standard Deviation (Within)	0.027
Maximum Value	16.850
Minimum Value	16.740

Capability Overall

Pp	1.120
Ppk	1.109
Cpm	1.120

Capability Within

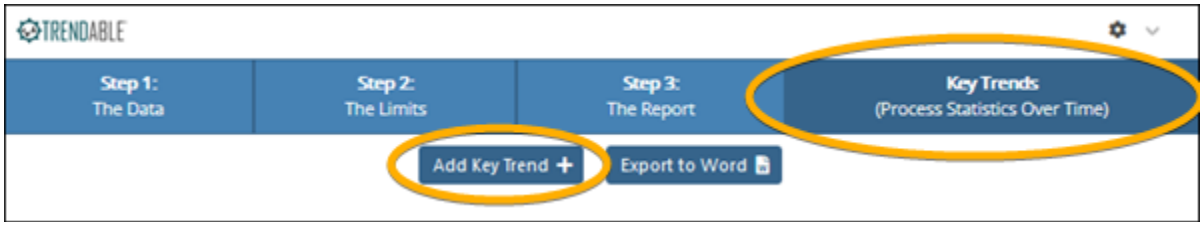
Cp	1.235
CpU	1.223
CpL	1.247
Cpk	1.223

The capability statistics confirm that the process is much more capable now than it was in week 2. Nice work! The increase in capability means that many fewer parts are being produced out of spec.

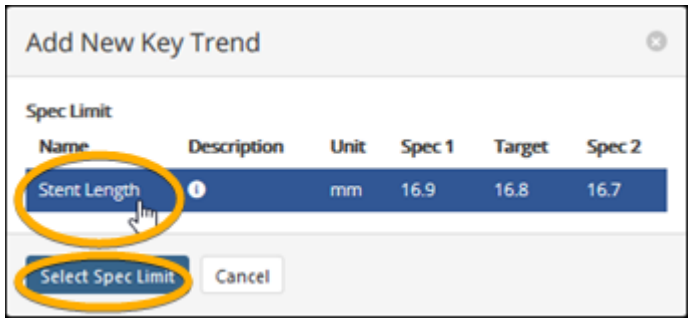
Review Key Trends

In addition to reporting on your sample data, TRENDABLE also keeps track of key statistics over time so you can graph them. Let's look at how Cpk changed from week 1 to week 3.

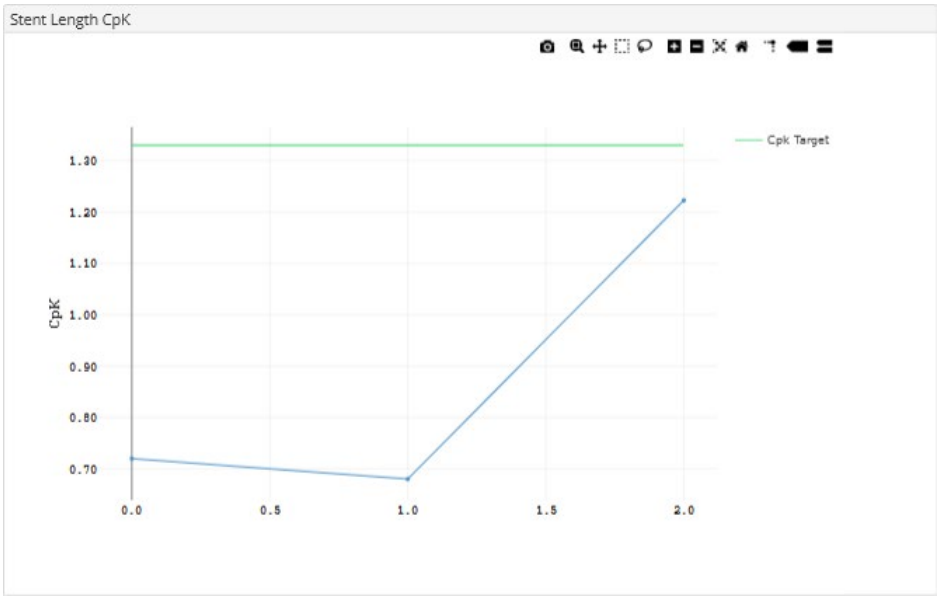
1. Click the **Key Trends** tab and click **Add Key Trend**.



2. Click **Stent Length**. and then click **Select Spec Limit**.



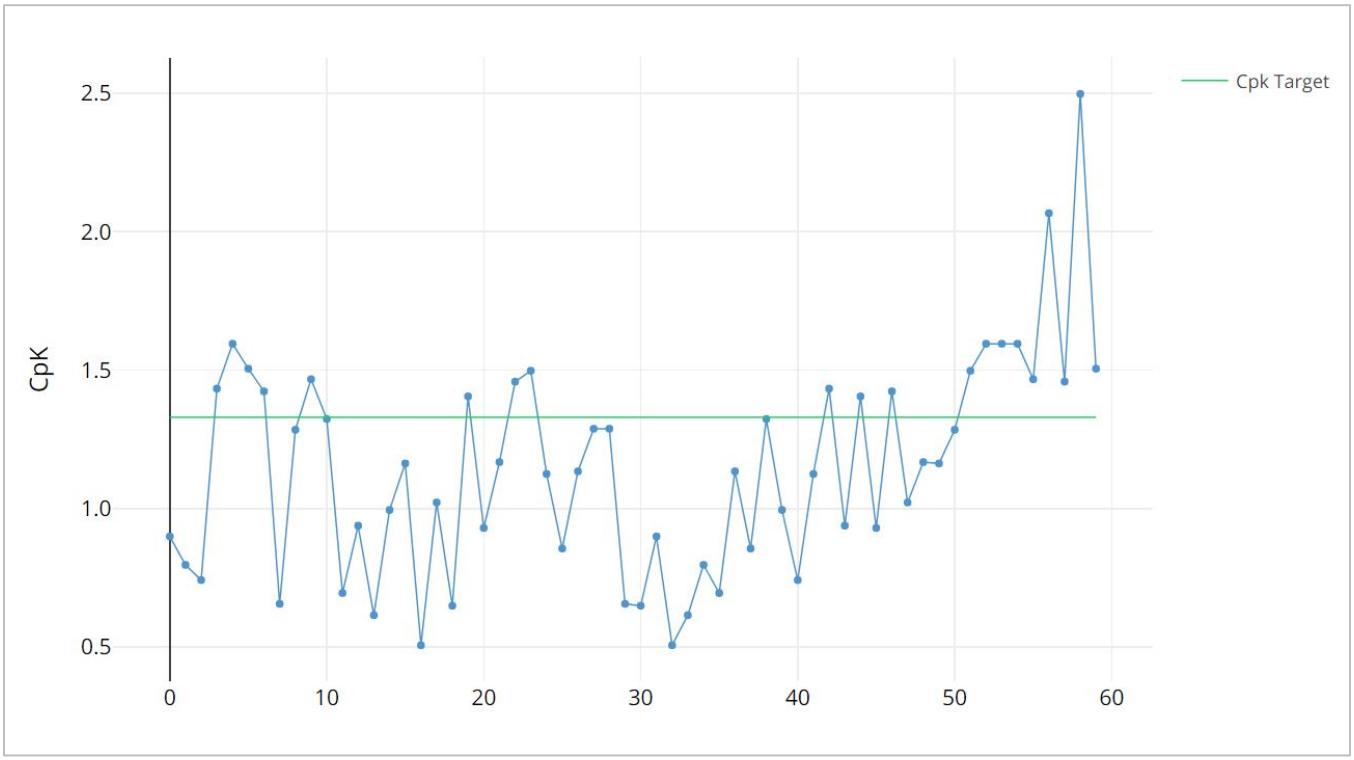
3. Select **Cpk** and click **Add Key Trend**.



The graph shows the initial decrease in capability from week 1 to week 2, followed by the big increase in capability from week 2 to week 3.

Each time you create a report, TRENDABLE stores the associated key trend statistics and adds them to plots you've created in the Key Trends tab.

Key trends plots provide a handy way to visualize the performance of your process over time. For example, the following graph shows how the capability of a process changed over the course of 59 analyses.



Note: To view and edit the key trend statistics that TRENDABLE has collected, click the gear icon ( ) in the upper right and select **Key Statistics**.

Now that you've seen how easy it is to analyze and track quality with TRENDABLE, we hope you'll make it your go-to tool for capability analysis.

Thanks for using TRENDABLE!